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EXAMINER	
COUGHLAN, PETER D	
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/627,355	LLINAS ET AL.	
	Examiner	Art Unit	
	PETER COUGHLAN	2129	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *14 November 2008*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *12-46* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *12-46* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *12/4/2003* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *'A'*.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application

6) ☐ Other: _____.

Detailed Action

1. This office action is in response to an AMENDMENT entered November 14, 2008 for the patent application 10/627355 filed on July 24, 2003.

2. All previous Office Actions are fully incorporated into this Non-Final Office Action by reference.

3. Examiner's Comment: Although, the terms 'carrier wave' or 'carrier signal' is not specifically mentioned within the specification, the Examiner will exclude these interpretations wherein the context of 'memory' is disclosed.

Status of Claims

4. Claims 12-46 are pending.

Claim Rejections - 35 USC § 112

5. The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

Claims 19, 27, 36 and 44 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. These claims state that ‘the step of creating a first cluster of control circuits and a second cluster of a control circuits, the first cluster of control circuits being characterized by a higher degree of coupling between control circuits of the first cluster relative to a lower degree of coupling between control circuits of the first cluster and control circuits of the second cluster.’ The claim language is very specific in this characteristic where as the specification is not as specific. The specification states that 'generally the coupling between units inside a cluster is stronger than between units at the boundary of clusters.’ The specification is not as precise as the claims.

These claims need to be amended or withdrawn from consideration.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made

to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 12, 13, 18-21, 26-30, 35-38, 43, 44, 46 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sedra in view of Fagg. (‘Microelectronic circuits’, referred to as **Sedra**; ‘Cerebellar Learning for Control of a two Link Arm in Muscle Space’, referred to as **Fagg**)

Claim 12

Sedra teaches a plurality of control circuits, each control circuit comprising the following elements (**Sedra,** p974-975, Fig 12.1; ‘Plurality of control circuits’ of applicant is disclosed by ‘amplifier A’ and ‘frequency-selective network B’ of Sedra.) an input receiving connection for receiving an input signal (**Sedra,** p974-975, Fig 12.1; ‘Input receiving connection’ of applicant is illustrated by the input of ‘X_s’ of Sedra.) an oscillation generation circuit for generating at a first output terminal an oscillation output signal having an amplitude, phase and a frequency. (**Sedra,** p974-975, Fig 12.1; The oscillator feedback loop of Sedra generates sinusoidal oscillations. It is inherent that oscillations have ‘amplitude, phase and a frequency.)

Sedra does not teach a first spike generation circuit in communication with the oscillation generation circuit for generating a first spike signal when the oscillation output signal crosses a first threshold value, the first spike signal being provided at the first output terminal a second spike generation circuit in communication with the

oscillation generation circuit for generating a second spike signal when the oscillation output signal crosses a second threshold value, the second spike signal being provided at the first output terminal wherein the oscillation output signal, the first spike signal and the second spike signal collectively form a composite output signal which is capable of controlling an actuating element, and wherein characteristic information of the actuating element is provided as part of the input signal to the control circuit.

Fagg teaches a first spike generation circuit in communication with the oscillation generation circuit for generating a first spike signal when the oscillation output signal crosses a first threshold value, the first spike signal being provided at the first output terminal (**Fagg,** p2638, C2:26 through p2639, C1:21; 'First spike generation circuit' of applicant is equivalent to the 'adjustable pattern generators' of Fagg. The 'first threshold' of applicant is disclosed by the desire to move the 'single muscle' of Fagg) a second spike generation circuit in communication with the oscillation generation circuit for generating a second spike signal when the oscillation output signal crosses a second threshold value, the second spike signal being provided at the first output terminal (**Fagg,** p2638, C2:26 through p2639, C1:21; 'Second spike generation circuit' of applicant is equivalent to the 'extra cerebellar (EC)' of Fagg. The 'second threshold' of applicant is if the arm reaches its goal or not. If the arm reached the goal, then the threshold has not been crossed. If the arm did not reach the goal, then the threshold has been crossed of Fagg) wherein the oscillation output signal, the first spike signal and the second spike signal collectively form a composite output signal (**Fagg,** p2638, C2:26 through p2639, C1:21; The combination of the spike signals and the oscillation

signal of applicant is disclosed by 'The combination of the two control modules are combined in the spinal/muscle system which transforms muscle space signals into joint torques' of Fagg.) which is capable of controlling an actuating element, and wherein characteristic information of the actuating element is provided as part of the input signal to the control circuit. (**Fagg,** p2638, C2:11 through p2639, C1:21; Controlling a 'actuating element' of applicant is equivalent to 'planer arm' of Fagg. 'Characteristic information' as 'part of the input signal to the control circuit' of applicant is disclosed by the inferior olive function as estimating movement errors which are then used to update the APG of Fagg.) It would have been obvious to a person having ordinary skill in the art at the time of applicant's invention to modify the teachings of Sedra by using one circuit to move an arm and a second circuit to make corrections as taught by Fagg to have a first spike generation circuit in communication with the oscillation generation circuit for generating a first spike signal when the oscillation output signal crosses a first threshold value, the first spike signal being provided at the first output terminal a second spike generation circuit in communication with the oscillation generation circuit for generating a second spike signal when the oscillation output signal crosses a second threshold value, the second spike signal being provided at the first output terminal wherein the oscillation output signal, the first spike signal and the second spike signal collectively form a composite output signal which is capable of controlling an actuating element, and wherein characteristic information of the actuating element is provided as part of the input signal to the control circuit.

For the purpose of using the second circuit to train the first circuit to increase movement efficiently.

Sedra teaches to thereby adjust one of the amplitude and frequency of the oscillation output signal. (**Sedra,** p974-975, Fig 12.1; 'Amplitude' of applicant is controlled by 'amplifier' of Sedra. 'Frequency' of applicant is controlled by 'frequency-selective' of Sedra.)

Sedra does not teach phase

Fagg teaches phase. (**Fagg,** abstract; 'Phase' of applicant is disclosed by 'This model uses the combination delayed sensory signals and …' of Fagg.) It would have been obvious to a person having ordinary skill in the art at the time of applicant's invention to modify the teachings of Sedra by changing the phase as taught by Fagg to have phase.

For the purpose of putting various oscillations into synchronous behavior for improved movement.

Claim 13

Sedra does not teach wherein a phase characteristic of the composite output signal of a first control circuit is maintained at a predetermined level relative to a phase characteristic of the composite output signal of a second control circuit.

Fagg teaches wherein a phase characteristic of the composite output signal of a first control circuit is maintained at a predetermined level relative to a phase characteristic of the composite output signal of a second control circuit. (**Fagg,** p2638,

C2:11 through p2639, C1:21; The ‘output signal of a first control circuit is maintained at a predetermined level relative to a phase characteristic of the composite output signal of a second control circuit’ of applicant is disclosed by the adjustable pattern generators functions with or without input from the extra-cerebellar module. The extra-cerebellar only becomes active when the arm does not reach it goal.) It would have been obvious to a person having ordinary skill in the art at the time of applicant’s invention to modify the teachings of Sedra by having independent output signals as taught by Fagg to have wherein a phase characteristic of the composite output signal of a first control circuit is maintained at a predetermined level relative to a phase characteristic of the composite output signal of a second control circuit.

For the purpose of having a different signal for correcting the movement of an arm.

Claim 18

Sedra does not teach a command input for controlling the coupling between control circuits.

Fagg teaches a command input for controlling the coupling between control circuits. (**Fagg,** p2638, C2:11 through p2639, C1:21; ‘Command input’ of applicant is equivalent to the ‘adjustable pattern generators each of which drive a single muscle’ of Fagg.) It would have been obvious to a person having ordinary skill in the art at the time of applicant’s invention to modify the teachings of Sedra by having adjustable input as

taught by Fagg to have a command input for controlling the coupling between control circuits.

For the purpose of being able to modify the circuits performance for improved results.

Claim 19

Sedra does not teach a first cluster of control circuits and a second cluster of control circuits, the first cluster of control circuits being characterized by a higher degree of coupling between control circuits of the first cluster relative to a lower degree of coupling between control circuits of the first cluster and control circuits of the second cluster.

Fagg teaches a first cluster of control circuits and a second cluster of control circuits, the first cluster of control circuits being characterized by a higher degree of coupling between control circuits of the first cluster relative to a lower degree of coupling between control circuits of the first cluster and control circuits of the second cluster. (**Fagg,** p2638, C2:26 through p2639, C1:21; 'First spike generation circuit' of applicant is equivalent to the 'adjustable pattern generators' of Fagg. The 'first threshold' of applicant is disclosed by the desire to move the 'single muscle' of Fagg. This operates regardless of input from the extra cerebellar. Thus there is a lower degree of coupling between the first and second circuits. The coupling within the first circuit is higher due to the specific function of movement of an arm is associated with the adjustable pattern generator.) It would have been obvious to a person having ordinary skill in the art at the

time of applicant's invention to modify the teachings of Sedra by having clusters acting semi-independently with other clusters as taught by Fagg to have a first cluster of control circuits and a second cluster of control circuits, the first cluster of control circuits being characterized by a higher degree of coupling between control circuits of the first cluster relative to a lower degree of coupling between control circuits of the first cluster and control circuits of the second cluster.

For the purpose of having clusters perform a given function with some coordination among other clusters for improved performance.

Claim 20

Sedra teaches a plurality of control circuits, each control circuit comprising the following elements (**Sedra,** p974-975, Fig 12.1; 'Plurality of control circuits' of applicant is disclosed by 'amplifier A' and 'frequency-selective network B' of Sedra.) an input receiving connection for receiving an input signal (**Sedra,** p974-975, Fig 12.1; 'Input receiving connection' of applicant is illustrated by the input of 'X_S' of Sedra.) an oscillation generation circuit for generating at a first output terminal and a second output terminal an oscillation output signal having an amplitude, phase and a frequency. (**Sedra,** p974-975, Fig 12.1; The oscillator feedback loop of Sedra generates sinusoidal oscillations. It is inherent that oscillations have 'amplitude, phase and a frequency.)

Sedra does not teach a first spike generation circuit in communication with the oscillation generation circuit for generating a first spike signal when the oscillation output signal crosses a first threshold value, the first spike signal being provided at the

first output terminal and the second output terminal a second spike generation circuit in communication with the oscillation generation circuit for generating a second spike signal when the oscillation output signal crosses a second threshold value, the second spike signal being provided at the first output terminal wherein the oscillation output signal, the first spike signal and the second spike signal collectively form a first composite output signal at the first output terminal, and the oscillation output signal and the first spike signal collectively form a second composite output signal at the second output terminal such that at least one of the composite output signals is capable of controlling an actuating element, and wherein characteristic information of the actuating element is provided as part of the input signal to the control circuit.

Fagg teaches a first spike generation circuit in communication with the oscillation generation circuit for generating a first spike signal when the oscillation output signal crosses a first threshold value, the first spike signal being provided at the first output terminal and the second output terminal (**Fagg,** p2638, C2:26 through p2639, C1:21; ‘First spike generation circuit’ of applicant is equivalent to the ‘adjustable pattern generators’ of Fagg. The ‘first threshold’ of applicant is disclosed by the desire to move the ‘single muscle’ of Fagg) a second spike generation circuit in communication with the oscillation generation circuit for generating a second spike signal when the oscillation output signal crosses a second threshold value, the second spike signal being provided at the first output terminal (**Fagg,** p2638, C2:26 through p2639, C1:21; ‘Second spike generation circuit’ of applicant is equivalent to the ‘extra cerebellar (EC)’ of Fagg. The ‘second threshold’ of applicant is if the arm reaches its goal or not. If the are reached

the goal, then the threshold has not been crossed. If the arm did not reach the goal, then the threshold has been crossed of Fagg) wherein the oscillation output signal, the first spike signal and the second spike signal collectively form a first composite output signal at the first output terminal, and the oscillation output signal and the first spike signal collectively form a second composite output signal at the second output terminal (**Fagg,** p2638, C2:26 through p2639, C1:21; The combination of the spike signals and the oscillation signal of applicant is disclosed by 'The combination of the two control modules are combined in the spinal/muscle system which transforms muscle space signals into joint torques' of Fagg.) such that at least one of the composite output signals is capable of controlling an actuating element, and wherein characteristic information of the actuating element is provided as part of the input signal to the control circuit. (**Fagg,** p2638, C2:11 through p2639, C1:21; Controlling a 'actuating element' of applicant is equivalent to 'planer arm' of Fagg. 'Characteristic information' as 'part of the input signal to the control circuit' of applicant is disclosed by the inferior olive function as estimating movement errors which are then used to update the APG of Fagg.) It would have been obvious to a person having ordinary skill in the art at the time of applicant's invention to modify the teachings of Sedra by using one circuit to move an arm and a second circuit to make corrections as taught by Fagg to have a first spike generation circuit in communication with the oscillation generation circuit for generating a first spike signal when the oscillation output signal crosses a first threshold value, the first spike signal being provided at the first output terminal and the second output terminal a second spike generation circuit in

communication with the oscillation generation circuit for generating a second spike signal when the oscillation output signal crosses a second threshold value, the second spike signal being provided at the first output terminal wherein the oscillation output signal, the first spike signal and the second spike signal collectively form a first composite output signal at the first output terminal, and the oscillation output signal and the first spike signal collectively form a second composite output signal at the second output terminal such that at least one of the composite output signals is capable of controlling an actuating element, and wherein characteristic information of the actuating element is provided as part of the input signal to the control circuit.

For the purpose of using the second circuit to train the first circuit to increase movement efficiently.

Sedra teaches to thereby adjust one of the amplitude and frequency of the oscillation output signal. (**Sedra,** p974-975, Fig 12.1; 'Amplitude' of applicant is controlled by 'amplifier' of Sedra. 'Frequency' of applicant is controlled by 'frequency-selective' of Sedra.)

Sedra does not teach phase.

Fagg teaches phase. (**Fagg,** abstract; 'Phase' of applicant is disclosed by 'This model uses the combination delayed sensory signals and ...' of Fagg.) It would have been obvious to a person having ordinary skill in the art at the time of applicant's invention to modify the teachings of Sedra by changing the phase as taught by Fagg to have phase. (copy what the applicant claims).

For the purpose of putting various oscillations into synchronous behavior for improved movement.

Claim 21

Sedra does not teach wherein a phase characteristic of the composite output signal of a first control circuit is maintained at a predetermined level relative to a phase characteristic of the composite output signal of a second control circuit.

Fagg teaches wherein a phase characteristic of the composite output signal of a first control circuit is maintained at a predetermined level relative to a phase characteristic of the composite output signal of a second control circuit. (**Fagg,** p2638, C2:11 through p2639, C1:21; The 'output signal of a first control circuit is maintained at a predetermined level relative to a phase characteristic of the composite output signal of a second control circuit' of applicant is disclosed by the adjustable pattern generators functions with or without input from the extra-cerebellar module. The extra-cerebellar only becomes active when the arm does not reach it goal.) It would have been obvious to a person having ordinary skill in the art at the time of applicant's invention to modify the teachings of Sedra by having independent output signals as taught by Fagg to have wherein a phase characteristic of the composite output signal of a first control circuit is maintained at a predetermined level relative to a phase characteristic of the composite output signal of a second control circuit.

For the purpose of having a different signal for correcting the movement of an arm.

Claim 26

Sedra does not teach a command input for controlling the coupling between control circuits.

Fagg teaches a command input for controlling the coupling between control circuits. (**Fagg,** p2638, C2:11 through p2639, C1:21; 'Command input' of applicant is equivalent to the 'adjustable pattern generators each of which drive a single muscle' of Fagg.) It would have been obvious to a person having ordinary skill in the art at the time of applicant's invention to modify the teachings of Sedra by having adjustable input as taught by Fagg to have a command input for controlling the coupling between control circuits.

For the purpose of being able to modify the circuits performance for improved results.

Claim 27

Sedra does not teach a first cluster of control circuits and a second cluster of control circuits, the first cluster of control circuits being characterized by a higher degree of coupling between control circuits of the first cluster relative to a lower degree of coupling between control circuits of the first cluster and control circuits of the second cluster.

Fagg teaches a first cluster of control circuits and a second cluster of control circuits, the first cluster of control circuits being characterized by a higher degree of

coupling between control circuits of the first cluster relative to a lower degree of coupling between control circuits of the first cluster and control circuits of the second cluster. (**Fagg,** p2638, C2:26 through p2639, C1:21; 'First spike generation circuit' of applicant is equivalent to the 'adjustable pattern generators' of Fagg. The 'first threshold' of applicant is disclosed by the desire to move the 'single muscle' of Fagg. This operates regardless of input from the extra cerebellar. Thus there is a lower degree of coupling between the first and second circuits. The coupling within the first circuit is higher due to the specific function of movement of an arm is associated with the adjustable pattern generator.) It would have been obvious to a person having ordinary skill in the art at the time of applicant's invention to modify the teachings of Sedra by having clusters acting semi-independently with other clusters as taught by Fagg to have a first cluster of control circuits and a second cluster of control circuits, the first cluster of control circuits being characterized by a higher degree of coupling between control circuits of the first cluster relative to a lower degree of coupling between control circuits of the first cluster and control circuits of the second cluster.

For the purpose of having clusters perform a given function with some coordination among other clusters for improved performance.

Claim 28

Sedra teaches a plurality of control circuits, each control circuit comprising the following elements (**Sedra,** p974-975, Fig 12.1; 'Plurality of control circuits' of applicant

is disclosed by ‘amplifier A’ and ‘frequency-selective network B’ of Sedra.) an input receiving connection for receiving an input signal (**Sedra,** p974-975, Fig 12.1; ‘Input receiving connection’ of applicant is illustrated by the input of ‘X_s’ of Sedra.) an oscillation generation circuit for generating at a first output terminal an oscillation output signal having an amplitude, phase and a frequency. (**Sedra,** p974-975, Fig 12.1; The oscillator feedback loop of Sedra generates sinusoidal oscillations. It is inherent that oscillations have ‘amplitude, phase and a frequency.)

Sedra does not teach a first spike generation circuit in communication with the oscillation generation circuit for generating a first spike signal when the oscillation output signal crosses a first threshold value, the first spike signal being provided at the first output terminal a second spike generation circuit in communication with the oscillation generation circuit for generating a second spike signal when the oscillation output signal crosses a second threshold value, the second spike signal being provided at the first output terminal wherein the oscillation output signal, the first spike signal and the second spike signal collectively form a composite output signal which is capable of controlling an actuating element, and wherein a sensor is used to obtain characteristic information of the actuating element such that the characteristic information is provided as part of the input signal to the control circuit.

Fagg teaches a first spike generation circuit in communication with the oscillation generation circuit for generating a first spike signal when the oscillation output signal crosses a first threshold value, the first spike signal being provided at the first output terminal (**Fagg,** p2638, C2:26 through p2639, C1:21; ‘First spike generation circuit’ of

applicant is equivalent to the 'adjustable pattern generators' of Fagg. The 'first threshold' of applicant is disclosed by the desire to move the 'single muscle' of Fagg) a second spike generation circuit in communication with the oscillation generation circuit for generating a second spike signal when the oscillation output signal crosses a second threshold value, the second spike signal being provided at the first output terminal (**Fagg,** p2638, C2:26 through p2639, C1:21; 'Second spike generation circuit' of applicant is equivalent to the 'extra cerebellar (EC)' of Fagg. The 'second threshold' of applicant is if the arm reaches its goal or not. If the are reached the goal, then the threshold has not been crossed. If the arm did not reach the goal, then the threshold has been crossed of Fagg) wherein the oscillation output signal, the first spike signal and the second spike signal collectively form a composite output signal (**Fagg,** p2638, C2:26 through p2639, C1:21; The combination of the spike signals and the oscillation signal of applicant is disclosed by 'The combination of the two control modules are combined in the spinal/muscle system which transforms muscle space signals into joint torques' of Fagg.) which is capable of controlling an actuating element, and wherein a sensor is used to obtain characteristic information of the actuating element such that the characteristic information is provided as part of the input signal to the control circuit. (**Fagg,** p2638, C2:11 through p2639, C1:21; Controlling a 'actuating element' of applicant is equivalent to 'planer arm' of Fagg. 'Characteristic information' as 'part of the input signal to the control circuit' of applicant is disclosed by the inferior olive function as estimating movement errors which are then used to update the APG of Fagg.) It would have been obvious to a person having ordinary skill in the art at the time of applicant's

invention to modify the teachings of Sedra by using one circuit to move an arm and a second circuit to make corrections as taught by Fagg to have a first spike generation circuit in communication with the oscillation generation circuit for generating a first spike signal when the oscillation output signal crosses a first threshold value, the first spike signal being provided at the first output terminal a second spike generation circuit in communication with the oscillation generation circuit for generating a second spike signal when the oscillation output signal crosses a second threshold value, the second spike signal being provided at the first output terminal wherein the oscillation output signal, the first spike signal and the second spike signal collectively form a composite output signal which is capable of controlling an actuating element, and wherein a sensor is used to obtain characteristic information of the actuating element such that the characteristic information is provided as part of the input signal to the control circuit.

For the purpose of using the second circuit to train the first circuit to increase movement efficiently.

Sedra teaches to thereby adjust one of the amplitude and frequency of the oscillation output signal. (**Sedra,** p974-975, Fig 12.1; 'Amplitude' of applicant is controlled by 'amplifier' of Sedra. 'Frequency' of applicant is controlled by 'frequency-selective' of Sedra.)

Sedra does not teach phase and further wherein the input signal is used to synchronize controlled movement of the actuation elements.

Fagg teaches phase, (**Fagg,** abstract; 'Phase' of applicant is disclosed by 'This model uses the combination delayed sensory signals and …' of Fagg.), and further

wherein the input signal is used to synchronize controlled movement of the actuation elements. (**Fagg,** abstract; 'Synchronize controlled movements' of applicant is illustrated by 'the model learns in a trial and error fashion to produce bursts of muscle activity that accurately bring the arm to a specific target' of Fagg.) It would have been obvious to a person having ordinary skill in the art at the time of applicant's invention to modify the teachings of Sedra by changing the phase as taught by Fagg to have phase and further wherein the input signal is used to synchronize controlled movement of the actuation elements.

For the purpose of putting various oscillations into synchronous behavior for improved movement.

Claim 29

Sedra teaches using a plurality of control circuits, each control circuit performing the following steps (**Sedra,** p974-975, Fig 12.1; 'Plurality of control circuits' of applicant is disclosed by 'amplifier A' and 'frequency-selective network B' of Sedra.) receiving an input signal at an input receiving connection (**Sedra,** p974-975, Fig 12.1; 'Input receiving connection' of applicant is illustrated by the input of 'X_s' of Sedra.) generating at a first output terminal an oscillation output signal having an amplitude and a frequency. (**Sedra,** p974-975, Fig 12.1; The oscillator feedback loop of Sedra generates sinusoidal oscillations. It is inherent that oscillations have 'amplitude, phase and a frequency.)

Sedra does not teach generating a first spike signal when the oscillation output signal crosses a first threshold value, the first spike signal being provided at the first output terminal generating a second spike signal when the oscillation output signal crosses a second threshold value, the second spike signal being provided at the first output terminal wherein the oscillation output signal, the first spike signal and the second spike signal collectively form a composite output signal which is capable of controlling an actuating element, and further comprising the step of obtaining characteristic information of the actuating element which is provided as part of the input signal to the control circuit.

Fagg teaches generating a first spike signal when the oscillation output signal crosses a first threshold value, the first spike signal being provided at the first output terminal (**Fagg,** p2638, C2:26 through p2639, C1:21; 'First spike generation circuit' of applicant is equivalent to the 'adjustable pattern generators' of Fagg. The 'first threshold' of applicant is disclosed by the desire to move the 'single muscle' of Fagg) generating a second spike signal when the oscillation output signal crosses a second threshold value, the second spike signal being provided at the first output terminal (**Fagg,** p2638, C2:26 through p2639, C1:21; 'Second spike generation circuit' of applicant is equivalent to the 'extra cerebellar (EC)' of Fagg. The 'second threshold' of applicant is if the arm reaches its goal or not. If the are reached the goal, then the threshold has not been crossed. If the arm did not reach the goal, then the threshold has been crossed of Fagg) wherein the oscillation output signal, the first spike signal and the second spike signal collectively form a composite output signal (**Fagg,** p2638,

C2:26 through p2639, C1:21; The combination of the spike signals and the oscillation signal of applicant is disclosed by ‘The combination of the two control modules are combined in the spinal/muscle system which transforms muscle space signals into joint torques’ of Fagg.) which is capable of controlling an actuating element, and further comprising the step of obtaining characteristic information of the actuating element which is provided as part of the input signal to the control circuit. (**Fagg,** p2638, C2:11 through p2639, C1:21; Controlling a ‘actuating element’ of applicant is equivalent to ‘planer arm’ of Fagg. ‘Characteristic information’ as ‘part of the input signal to the control circuit’ of applicant is disclosed by the inferior olive function as estimating movement errors which are then used to update the APG of Fagg.) It would have been obvious to a person having ordinary skill in the art at the time of applicant’s invention to modify the teachings of Sedra by using one circuit to move an arm and a second circuit to make corrections as taught by Fagg to generating a first spike signal when the oscillation output signal crosses a first threshold value, the first spike signal being provided at the first output terminal generating a second spike signal when the oscillation output signal crosses a second threshold value, the second spike signal being provided at the first output terminal wherein the oscillation output signal, the first spike signal and the second spike signal collectively form a composite output signal which is capable of controlling an actuating element, and further comprising the step of obtaining characteristic information of the actuating element which is provided as part of the input signal to the control circuit.

For the purpose of using the second circuit to train the first circuit to increase movement efficiently.

Sedra teaches to thereby adjust one of the amplitude and frequency of the oscillation output signal. (**Sedra,** p974-975, Fig 12.1; 'Amplitude' of applicant is controlled by 'amplifier' of Sedra. 'Frequency' of applicant is controlled by 'frequency-selective' of Sedra.)

Sedra does not teach phase.

Fagg teaches phase. (**Fagg,** abstract; 'Phase' of applicant is disclosed by 'This model uses the combination delayed sensory signals and …' of Fagg.) It would have been obvious to a person having ordinary skill in the art at the time of applicant's invention to modify the teachings of Sedra by changing the phase as taught by Fagg to have phase.

For the purpose of putting various oscillations into synchronous behavior for improved movement.

Claim 30

Sedra does not teach wherein a phase characteristic of the composite output signal of a first control circuit is maintained relative to a phase characteristic of the composite output signal of a second control circuit.

Fagg teaches wherein a phase characteristic of the composite output signal of a first control circuit is maintained relative to a phase characteristic of the composite output signal of a second control circuit. (**Fagg,** p2638, C2:11 through p2639, C1:21;

The ‘output signal of a first control circuit is maintained at a predetermined level relative to a phase characteristic of the composite output signal of a second control circuit’ of applicant is disclosed by the adjustable pattern generators functions with or without input from the extra-cerebellar module. The extra-cerebellar only becomes active when the arm does not reach it goal.) It would have been obvious to a person having ordinary skill in the art at the time of applicant’s invention to modify the teachings of Sedra by having independent output signals as taught by Fagg to have wherein a phase characteristic of the composite output signal of a first control circuit is maintained relative to a phase characteristic of the composite output signal of a second control circuit.

For the purpose of having a different signal for correcting the movement of an arm.

Claim 35

Sedra does not teach the step of applying a command input for controlling the coupling between control circuits.

Fagg teaches the step of applying a command input for controlling the coupling between control circuits. (**Fagg,** p2638, C2:11 through p2639, C1:21; ‘Command input’ of applicant is equivalent to the ‘adjustable pattern generators each of which drive a single muscle’ of Fagg.) It would have been obvious to a person having ordinary skill in the art at the time of applicant’s invention to modify the teachings of Sedra by having

adjustable input as taught by Fagg to have the step of applying a command input for controlling the coupling between control circuits.

For the purpose of being able to modify the circuits performance for improved results.

Claim 36

Sedra does not teach the step of creating a first cluster of control circuits and a second cluster of a control circuits, the first cluster of control circuits being characterized by a higher degree of coupling between control circuits of the first cluster relative to a lower degree of coupling between control circuits of the first cluster and control circuits of the second cluster.

Fagg teaches the step of creating a first cluster of control circuits and a second cluster of a control circuits, the first cluster of control circuits being characterized by a higher degree of coupling between control circuits of the first cluster relative to a lower degree of coupling between control circuits of the first cluster and control circuits of the second cluster. (**Fagg,** p2638, C2:26 through p2639, C1:21; 'First spike generation circuit' of applicant is equivalent to the 'adjustable pattern generators' of Fagg. The 'first threshold' of applicant is disclosed by the desire to move the 'single muscle' of Fagg. This operates regardless of input from the extra cerebellar. Thus there is a lower degree of coupling between the first and second circuits. The coupling within the first circuit is higher due to the specific function of movement of an arm is associated with the adjustable pattern generator.) It would have been obvious to a person having ordinary

skill in the art at the time of applicant's invention to modify the teachings of Sedra by having clusters acting semi-independently with other clusters as taught by Fagg to have the step of creating a first cluster of control circuits and a second cluster of a control circuits, the first cluster of control circuits being characterized by a higher degree of coupling between control circuits of the first cluster relative to a lower degree of coupling between control circuits of the first cluster and control circuits of the second cluster.

For the purpose of having clusters perform a given function with some coordination among other clusters for improved performance.

Claim 37

Sedra teaches using a plurality of control circuits (**Sedra,** p974-975, Fig 12.1; 'Plurality of control circuits' of applicant is disclosed by 'amplifier A' and 'frequency-selective network B' of Sedra.), each control circuit performing the following steps: receiving an input signal at an input receiving connection (**Sedra,** p974-975, Fig 12.1; Both of the 'amplifier A' and 'frequency-selective network B' of Sedra have the ability to receive input signals.), generating at a first output terminal and at a second output terminal (**Sedra,** p974-975, Fig 12.1; One example of a 'first output terminal' of applicant is disclosed by the output of the 'amplifier A' of Sedra. An example of a second output terminal of applicant is disclosed by the output of the 'frequency-selective network B' of Sedra.) an oscillation output signal having an amplitude, phase and a frequency.

(**Sedra,** p974-975, Fig 12.1; The oscillator feedback loop of Sedra generates sinusoidal oscillations. It is inherent that oscillations have ‘amplitude, phase and a frequency.)

Sedra does not teach generating a first spike signal when the oscillation output signal crosses a first threshold value, the first spike signal being provided at the first output terminal and the second output terminal generating a second spike signal when the oscillation output signal crosses a second threshold value, the second spike signal being provided at the first output terminal wherein the oscillation output signal, the first spike signal and the second spike signal collectively form a composite output signal at the first output terminal, and the oscillation output signal and the first spike signal collectively form a second composite output signal at the second output terminal such that at least one of the composite output signals is capable of controlling an actuating element, and further comprising the step of obtaining characteristic information of the actuating element which is provided as part of the input signal to the control circuit.

Fagg teaches generating a first spike signal when the oscillation output signal crosses a first threshold value, the first spike signal being provided at the first output terminal and the second output terminal (**Fagg,** p2638, C2:26 through p2639, C1:21; ‘First spike generation circuit’ of applicant is equivalent to the ‘adjustable pattern generators’ of Fagg. The ‘first threshold’ of applicant is disclosed by the desire to move the ‘single muscle’ of Fagg) generating a second spike signal when the oscillation output signal crosses a second threshold value, the second spike signal being provided at the first output terminal (**Fagg,** p2638, C2:26 through p2639, C1:21; ‘Second spike generation circuit’ of applicant is equivalent to the ‘extra cerebellar (EC)’ of Fagg. The

'second threshold' of applicant is if the arm reaches its goal or not. If the are reached the goal, then the threshold has not been crossed. If the arm did not reach the goal, then the threshold has been crossed of Fagg) wherein the oscillation output signal, the first spike signal and the second spike signal collectively form a composite output signal at the first output terminal, and the oscillation output signal and the first spike signal collectively form a second composite output signal at the second output terminal (**Fagg,** p2638, C2:26 through p2639, C1:21; The combination of the spike signals and the oscillation signal of applicant is disclosed by 'The combination of the two control modules are combined in the spinal/muscle system which transforms muscle space signals into joint torques' of Fagg.) such that at least one of the composite output signals is capable of controlling an actuating element, and further comprising the step of obtaining characteristic information of the actuating element which is provided as part of the input signal to the control circuit. (**Fagg,** p2638, C2:11 through p2639, C1:21; Controlling a 'actuating element' of applicant is equivalent to 'planer arm' of Fagg. 'Characteristic information' as 'part of the input signal to the control circuit' of applicant is disclosed by the inferior olive function as estimating movement errors which are then used to update the APG of Fagg.) It would have been obvious to a person having ordinary skill in the art at the time of applicant's invention to modify the teachings of Sedra by using one circuit to move an arm and a second circuit to make corrections as taught by Fagg to generating a first spike signal when the oscillation output signal crosses a first threshold value, the first spike signal being provided at the first output terminal and the second output terminal generating a second spike signal when the

oscillation output signal crosses a second threshold value, the second spike signal being provided at the first output terminal wherein the oscillation output signal, the first spike signal and the second spike signal collectively form a composite output signal at the first output terminal, and the oscillation output signal and the first spike signal collectively form a second composite output signal at the second output terminal such that at least one of the composite output signals is capable of controlling an actuating element, and further comprising the step of obtaining characteristic information of the actuating element which is provided as part of the input signal to the control circuit.

For the purpose of using the second circuit to train the first circuit to increase movement efficiently.

Sedra teaches to thereby adjust one of the amplitude and frequency of the oscillation output signal. (**Sedra,** p974-975, Fig 12.1; 'Amplitude' of applicant is controlled by 'amplifier' of Sedra. 'Frequency' of applicant is controlled by 'frequency-selective' of Sedra.)

Sedra does not teach phase.

Fagg teaches phase. (**Fagg,** abstract; 'Phase' of applicant is disclosed by 'This model uses the combination delayed sensory signals and …' of Fagg.) It would have been obvious to a person having ordinary skill in the art at the time of applicant's invention to modify the teachings of Sedra by changing the phase as taught by Fagg to have phase.

For the purpose of putting various oscillations into synchronous behavior for improved movement.

Claim 38

Sedra does not teach wherein a phase characteristic of the composite output signal of a first control circuit is maintained relative to a phase characteristic of the composite output signal of a second control circuit.

Fagg teaches wherein a phase characteristic of the composite output signal of a first control circuit is maintained relative to a phase characteristic of the composite output signal of a second control circuit. (**Fagg,** p2638, C2:11 through p2639, C1:21; The 'output signal of a first control circuit is maintained at a predetermined level relative to a phase characteristic of the composite output signal of a second control circuit' of applicant is disclosed by the adjustable pattern generators functions with or without input from the extra-cerebellar module. The extra-cerebellar only becomes active when the arm does not reach it goal.) It would have been obvious to a person having ordinary skill in the art at the time of applicant's invention to modify the teachings of Sedra by having independent output signals as taught by Fagg to have wherein a phase characteristic of the composite output signal of a first control circuit is maintained relative to a phase characteristic of the composite output signal of a second control circuit.

For the purpose of having a different signal for correcting the movement of an arm.

Claim 43

Sedra does not teach the step of applying a command input for controlling the coupling between control circuits.

Fagg teaches the step of applying a command input for controlling the coupling between control circuits. (**Fagg,** p2638, C2:11 through p2639, C1:21; ‘Command input’ of applicant is equivalent to the ‘adjustable pattern generators each of which drive a single muscle’ of Fagg.) It would have been obvious to a person having ordinary skill in the art at the time of applicant’s invention to modify the teachings of Sedra by having adjustable input as taught by Fagg to have the step of applying a command input for controlling the coupling between control circuits.

For the purpose of being able to modify the circuits performance for improved results.

Claim 44

Sedra does not teach the step of creating a first cluster of control circuits and a second cluster of a control circuits, the first cluster of control circuits being characterized by a higher degree of coupling between control circuits of the first cluster relative to a lower degree of coupling between control circuits of the first cluster and control circuits of the second cluster.

Fagg teaches the step of creating a first cluster of control circuits and a second cluster of a control circuits, the first cluster of control circuits being characterized by a higher degree of coupling between control circuits of the first cluster relative to a lower degree of coupling between control circuits of the first cluster and control circuits of the

second cluster. (**Fagg,** p2638, C2:26 through p2639, C1:21; 'First spike generation circuit' of applicant is equivalent to the 'adjustable pattern generators' of Fagg. The 'first threshold' of applicant is disclosed by the desire to move the 'single muscle' of Fagg. This operates regardless of input from the extra cerebellar. Thus there is a lower degree of coupling between the first and second circuits. The coupling within the first circuit is higher due to the specific function of movement of an arm is associated with the adjustable pattern generator.) It would have been obvious to a person having ordinary skill in the art at the time of applicant's invention to modify the teachings of Sedra by having clusters acting semi-independently with other clusters as taught by Fagg to have the step of creating a first cluster of control circuits and a second cluster of a control circuits, the first cluster of control circuits being characterized by a higher degree of coupling between control circuits of the first cluster relative to a lower degree of coupling between control circuits of the first cluster and control circuits of the second cluster.

For the purpose of having clusters perform a given function with some coordination among other clusters for improved performance.

Claim 46

Sedra does not teach wherein the first spike signal and the second spike signal have different amplitudes.

Fagg teaches wherein the first spike signal and the second spike signal have different amplitudes. (**Fagg,** p2638, C2:26 through p2639, C1:21; It is inherent that the second spike signal have a different amplitude than the first due to the design that the

second spike signal is a correcting factor for the first spike signal. ‘Second spike generation circuit’ of applicant is equivalent to the ‘extra cerebellar (EC)’ of Fagg. The ‘second threshold’ of applicant is if the arm reaches its goal or not. If the are reached the goal, then the threshold has not been crossed. If the arm did not reach the goal, then the threshold has been crossed of Fagg) It would have been obvious to a person having ordinary skill in the art at the time of applicant’s invention to modify the teachings of Sedra by having different signals as taught by Fagg to have wherein the first spike signal and the second spike signal have different amplitudes.

For the purpose of using the second signal as a correction signal for the corresponding movement of the arm.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 14-17, 22-25, 31-34, 39-42 are rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Sedra and Fagg in view of Nekorkin. ('Homoclinic orbits and solitary waves in a one dimensional array of Chua's circuits', referred to as **Nekorkin**)

Claim 14

Sedra and Fagg do not teach at least one coupling element for coupling adjacent control circuits.

Nekorkin teaches at least one coupling element for coupling adjacent control circuits. (**Nekorkin,** p785, C1:1 through p786 C2:23; 'Coupling element for coupling adjacent control circuits' of applicant is illustrated by 'dynamics of coupled electronic oscillators' and 'The parameter d characterizes the strength of the coupling between the elements' of Nekorkin.) It would have been obvious to a person having ordinary skill in the art at the time of applicant's invention to modify the combined teachings of Sedra and Fagg by having a link between adjacent neurons as taught by Nekorkin to have at least one coupling element for coupling adjacent control circuits.

Based on the assumption that adjacent neurons relate to adjacent engines, coupled neurons relate to coordination between neurons.

Claim 15

Sedra and Fagg do not teach wherein the coupling element comprises a variable impedance element.

Nekorkin teaches wherein the coupling element comprises a variable impedance element. (**Nekorkin,** p785, C1:1 through p786 C2:23; ‘Variable impedance element’ of applicant is equivalent to ‘The nonlinear function f(x) describes the three segment piecewise linear resistor characteristic g(V).’ of Nekorkin.) It would have been obvious to a person having ordinary skill in the art at the time of applicant’s invention to modify the combined teachings of Sedra and Fagg by having a variable input for coupling as taught by Nekorkin to have wherein the coupling element comprises a variable impedance element.

For the purpose of reducing or increasing the coordination between the neurons to achieve the task at hand.

Claim 16

Sedra and Fagg do not teach a plurality of coupling elements, each coupling element connected to two adjacent control circuits to thereby provide coupling between the two adjacent control circuits.

Nekorkin teaches a plurality of coupling elements, each coupling element connected to two adjacent control circuits to thereby provide coupling between the two adjacent control circuits. (**Nekorkin,** p785, abstract; ‘Plurality of coupling elements’ of applicant is disclosed by ‘models of coupled nonlinear oscillators’ of Nekorkin.) It would have been obvious to a person having ordinary skill in the art at the time of applicant’s invention to modify the combined teachings of Sedra and Fagg by having a connection between neurons as taught by Nekorkin to have a plurality of coupling elements, each

coupling element connected to two adjacent control circuits to thereby provide coupling between the two adjacent control circuits.

For the purpose of being able to establish a link between two neurons for improving a coordination effort for the task at hand.

Claim 17

Sedra and Fagg do not teach wherein the impedance of the coupling elements is altered to thereby modify synchronization between coupled control circuits.

Nekorkin teaches wherein the impedance of the coupling elements is altered to thereby modify synchronization between coupled control circuits. (**Nekorkin,** p785, abstract; 'Modify synchronization between coupled control circuits' of applicant is disclosed by the study of nonlinear synchronization arrays and arrays of electronic oscillators of Nekorkin.) It would have been obvious to a person having ordinary skill in the art at the time of applicant's invention to modify the combined teachings of Sedra and Fagg by using coupling to establish synchronization as taught by Nekorkin to have wherein the impedance of the coupling elements is altered to thereby modify synchronization between coupled control circuits.

For the purpose of obtaining synchronization between neurons.

Claim 22

Sedra and Fagg do not teach at least one coupling element for coupling adjacent control circuits.

Nekorkin teaches at least one coupling element for coupling adjacent control circuits. (**Nekorkin,** p785, C1:1 through p786 C2:23; 'Coupling element for coupling adjacent control circuits' of applicant is illustrated by 'dynamics of coupled electronic oscillators' and 'The parameter d characterizes the strength of the coupling between the elements' of Nekorkin.) It would have been obvious to a person having ordinary skill in the art at the time of applicant's invention to modify the combined teachings of Sedra and Fagg by having a link between adjacent neurons as taught by Nekorkin to have at least one coupling element for coupling adjacent control circuits.

Based on the assumption that adjacent neurons relate to adjacent engines, coupled neurons relate to coordination between neurons.

Claim 23

Sedra and Fagg do not teach wherein the coupling element comprises a variable impedance element.

Nekorkin teaches wherein the coupling element comprises a variable impedance element. (**Nekorkin,** p785, C1:1 through p786 C2:23; 'Variable impedance element' of applicant is equivalent to 'The nonlinear function f(x) describes the three segment piecewise linear resistor characteristic g(V).' of Nekorkin.) It would have been obvious to a person having ordinary skill in the art at the time of applicant's invention to modify the combined teachings of Sedra and Fagg by having a variable input for coupling as taught

by Nekorkin to have wherein the coupling element comprises a variable impedance element.

For the purpose of reducing or increasing the coordination between the neurons to achieve the task at hand.

Claim 24

Sedra and Fagg do not teach a plurality of coupling elements, each coupling element connected to two adjacent control circuits to thereby provide coupling between the two adjacent control circuits.

Nekorkin teaches a plurality of coupling elements, each coupling element connected to two adjacent control circuits to thereby provide coupling between the two adjacent control circuits. (**Nekorkin,** p785, abstract; 'Plurality of coupling elements' of applicant is disclosed by 'models of coupled nonlinear oscillators' of Nekorkin.) It would have been obvious to a person having ordinary skill in the art at the time of applicant's invention to modify the combined teachings of Sedra and Fagg by having a connection between neurons as taught by Nekorkin to have a plurality of coupling elements, each coupling element connected to two adjacent control circuits to thereby provide coupling between the two adjacent control circuits.

For the purpose of being able to establish a link between two neurons for improving a coordination effort for the task at hand.

Claim 25

Sedra and Fagg do not teach wherein the impedance of the coupling elements is altered to thereby modify synchronization between coupled control circuits.

Nekorkin teaches wherein the impedance of the coupling elements is altered to thereby modify synchronization between coupled control circuits. (**Nekorkin,** p785, abstract; ‘Modify synchronization between coupled control circuits’ of applicant is disclosed by the study of nonlinear synchronization arrays and arrays of electronic oscillators of Nekorkin.) It would have been obvious to a person having ordinary skill in the art at the time of applicant’s invention to modify the combined teachings of Sedra and Fagg by using coupling to establish synchronization as taught by Nekorkin to have wherein the impedance of the coupling elements is altered to thereby modify synchronization between coupled control circuits.

For the purpose of obtaining synchronization between neurons.

Claim 31

Sedra and Fagg do not teach the step of using at least one coupling element for coupling adjacent control circuits.

Nekorkin teaches the step of using at least one coupling element for coupling adjacent control circuits. (**Nekorkin,** p785, C1:1 through p786 C2:23; ‘Coupling element for coupling adjacent control circuits’ of applicant is illustrated by ‘dynamics of coupled electronic oscillators’ and ‘The parameter d characterizes the strength of the coupling between the elements’ of Nekorkin.) It would have been obvious to a person having

ordinary skill in the art at the time of applicant's invention to modify the combined teachings of Sedra and Fagg by having a link between adjacent neurons as taught by Nekorkin to have the step of using at least one coupling element for coupling adjacent control circuits.

Based on the assumption that adjacent neurons relate to adjacent engines, coupled neurons relate to coordination between neurons.

Claim 32

Sedra and Fagg do not teach wherein the coupling element comprises a variable impedance element

Nekorkin teaches wherein the coupling element comprises a variable impedance element. (**Nekorkin,** p785, C1:1 through p786 C2:23; 'Variable impedance element' of applicant is equivalent to 'The nonlinear function f(x) describes the three segment piecewise linear resistor characteristic g(V).' of Nekorkin.) It would have been obvious to a person having ordinary skill in the art at the time of applicant's invention to modify the combined teachings of Sedra and Fagg by having a variable input for coupling as taught by Nekorkin to have wherein the coupling element comprises a variable impedance element

For the purpose of reducing or increasing the coordination between the neurons to achieve the task at hand.

Claim 33

Sedra and Fagg do not teach the step of using a plurality of coupling elements, each coupling element connected to two adjacent control circuits to thereby provide coupling between the two adjacent control circuits.

Nekorkin teaches the step of using a plurality of coupling elements, each coupling element connected to two adjacent control circuits to thereby provide coupling between the two adjacent control circuits. (**Nekorkin,** p785, abstract; ‘Plurality of coupling elements’ of applicant is disclosed by ‘models of coupled nonlinear oscillators’ of Nekorkin.) It would have been obvious to a person having ordinary skill in the art at the time of applicant’s invention to modify the combined teachings of Sedra and Fagg by having a connection between neurons as taught by Nekorkin to have the step of using a plurality of coupling elements, each coupling element connected to two adjacent control circuits to thereby provide coupling between the two adjacent control circuits.

For the purpose of being able to establish a link between two neurons for improving a coordination effort for the task at hand.

Claim 34

Sedra and Fagg do not teach the step of altering the impedance to thereby modify synchronization between coupled control circuits.

Nekorkin teaches the step of altering the impedance to thereby modify synchronization between coupled control circuits. (**Nekorkin,** p785, abstract; ‘Modify synchronization between coupled control circuits’ of applicant is disclosed by the study

of nonlinear synchronization arrays and arrays of electronic oscillators of Nekorkin.) It would have been obvious to a person having ordinary skill in the art at the time of applicant's invention to modify the combined teachings of Sedra and Fagg by using coupling to establish synchronization as taught by Nekorkin to have the step of altering the impedance to thereby modify synchronization between coupled control circuits.

For the purpose of obtaining synchronization between neurons.

Claim 39

Sedra and Fagg do not teach the step of using at least one coupling element for coupling adjacent control circuits.

Nekorkin teaches the step of using at least one coupling element for coupling adjacent control circuits. (**Nekorkin,** p785, C1:1 through p786 C2:23; 'Coupling element for coupling adjacent control circuits' of applicant is illustrated by 'dynamics of coupled electronic oscillators' and 'The parameter d characterizes the strength of the coupling between the elements' of Nekorkin.) It would have been obvious to a person having ordinary skill in the art at the time of applicant's invention to modify the combined teachings of Sedra and Fagg by having a link between adjacent neurons as taught by Nekorkin to have the step of using at least one coupling element for coupling adjacent control circuits.

Based on the assumption that adjacent neurons relate to adjacent engines, coupled neurons relate to coordination between neurons.

Claim 40

Sedra and Fagg do not teach the coupling element comprises a variable impedance element.

Nekorkin teaches the coupling element comprises a variable impedance element. (**Nekorkin,** p785, C1:1 through p786 C2:23; 'Variable impedance element' of applicant is equivalent to 'The nonlinear function f(x) describes the three segment piecewise linear resistor characteristic g(V).' of Nekorkin.) It would have been obvious to a person having ordinary skill in the art at the time of applicant's invention to modify the combined teachings of Sedra and Fagg by having a variable input for coupling as taught by Nekorkin to have the coupling element comprises a variable impedance element.

For the purpose of reducing or increasing the coordination between the neurons to achieve the task at hand.

Claim 41

Sedra and Fagg do not teach the step of using a plurality of coupling elements, each coupling element connected to two adjacent control circuits to thereby provide coupling between the two adjacent control circuits.

Nekorkin teaches the step of using a plurality of coupling elements, each coupling element connected to two adjacent control circuits to thereby provide coupling between the two adjacent control circuits. (**Nekorkin,** p785, abstract; 'Plurality of coupling elements' of applicant is disclosed by 'models of coupled nonlinear oscillators'

of Nekorkin.) It would have been obvious to a person having ordinary skill in the art at the time of applicant's invention to modify the combined teachings of Sedra and Fagg by having a connection between neurons as taught by Nekorkin to have the step of using a plurality of coupling elements, each coupling element connected to two adjacent control circuits to thereby provide coupling between the two adjacent control circuits.

For the purpose of being able to establish a link between two neurons for improving a coordination effort for the task at hand.

Claim 42

Sedra and Fagg do not teach the step of altering the impedance to thereby modify synchronization between coupled control circuits.

Nekorkin teaches the step of altering the impedance to thereby modify synchronization between coupled control circuits. (**Nekorkin,** p785, abstract; 'Modify synchronization between coupled control circuits' of applicant is disclosed by the study of nonlinear synchronization arrays and arrays of electronic oscillators of Nekorkin.) It would have been obvious to a person having ordinary skill in the art at the time of applicant's invention to modify the combined teachings of Sedra and Fagg by using coupling to establish synchronization as taught by Nekorkin to have the step of altering the impedance to thereby modify synchronization between coupled control circuits.

For the purpose of obtaining synchronization between neurons.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claim 45 is rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Sedra and Fagg in view of Gontowski. ('U. S. Patent 4720689', referred to as **Gontowski**)

Claim 45

Sedra and Fagg do not teach wherein the first spike generation circuit generates the first spike signal at a peak of the oscillation output signal.

Gontowski teaches wherein the first spike generation circuit generates the first spike signal at a peak of the oscillation output signal. (**Gontowski,** C7:50 through C8:13; 'Spike signal at a peak of the oscillation output' of applicant is equivalent to 'spike or pulse is formed at the peaks and valleys of the timing capacitor' of Gontowski.) It would have been obvious to a person having ordinary skill in the art at the time of applicant's invention to modify the combined teachings of Sedra and Fagg by having the

spike be generated at the peak of the oscillation cycle as taught by Gontowski to have wherein the first spike generation circuit generates the first spike signal at a peak of the oscillation output signal.

For the purpose to mimic a biological system with an established performance envelope.

Response to Arguments

6. Applicant's arguments filed on November 14, 2008 for claims 12-46 have been fully considered but are not persuasive.

7. In reference to the Applicant's argument:

Claim Rejections - 35 U.S.C. § 112

Claims 19, 27, and 36 stand rejected under 35 U.S.C. § 112, first paragraph, for failing to
comply with the written description requirement. These claims require "a first cluster of control circuits and a second cluster of control circuits, the first cluster of control circuits being characterized by a higher degree of coupling between control circuits of the first cluster relative to a lower degree of coupling between control circuits of the first cluster and control circuits of the second cluster." The Examiner states that there is no description in the specification which illustrates which circuits result in higher or lower coupling. In response, Applicants direct the Examiner's attention to paragraph 189 of the published application which states that "[g]enerally, the coupling between units inside a cluster is stronger than between units at the boundary of clusters" (Published application, paragraph 189). Moreover, Applicants respectfully direct the Examiner's attention to page 29 of the present office action wherein the Examiner withdraws written description rejections to claims 19, 27, and 36 based on similar arguments raised by the

Applicants in response to an identical rejection in the office action dated August 13, 2007. Accordingly, Applicants request that these rejections be withdrawn.

Examiner's response:

The rejection stands. The specification is not as specific as the claims.

8. In reference to the Applicant's argument:

Claims 19, 27, and 36 also stand rejected under 35 U.S.C. § 112, second paragraph, for being indefinite because, according to the Examiner, the word 'generally' as used in the specification is indefinite. The specification states "[g]enerally, the coupling between units inside a cluster is stronger than between units at the boundary of clusters" (Published application, paragraph 189). The term 'generally' is defined as "usually; commonly; ordinarily" (Random House Webster's Unabridged Dictionary (2"d ed. 1998)). Thus, the specification discloses that the coupling between units inside a cluster is usually stronger than between units at the boundary of clusters. Therefore, the specification discloses two distinct scenarios: usually, the coupling between units inside a cluster is stronger than the coupling between units at the boundary of clusters; and, less commonly, the coupling between units at the boundary of clusters is stronger than or equal to the coupling between units inside a cluster. The term 'generally' is not recited in the claims. Claims 19, 27, and 36 each recite "the first cluster of control circuits being characterized by a higher degree of coupling between control circuits of the first cluster relative to a lower degree of coupling between control circuits of the first cluster and control circuits of the second cluster." Thus, Applicants respectfully submit that these claims are directed to the first scenario disclosed by the specification and are therefore not indefinite. Accordingly, Applicants request that these rejections be withdrawn.

Examiner's response:

The Examiner notes the applicant's argument and withdraws the rejection.

9. In reference to the Applicant's argument:

Claims 13, 21, 30, and 38 stand rejected under 35 U.S.C. § 112, first paragraph, for failing to comply with the written description requirement because they use the term "phase characteristic", which the Examiner contends is not described in the specification in connection with the phase characteristic of an output of a first circuit being maintained relative to a phase characteristic of an output of a second circuit. In response, Applicants respectfully direct the Examiner's attention to paragraphs 194 and 201 of the published application, which describe phase synchronization among units. Applicants further direct the Examiner's attention to page 31 of the present office action wherein the Examiner withdraws rejections of claims 13, 21, 30, and 38 based on the Applicants' arguments in response to an identical rejection in the office action dated August 13, 2007. Accordingly, Applicants respectfully request that these rejections be withdrawn.

Examiner's response:

The Examiner notes the applicant argument's and disagrees. The Examiner does not view the statement 'wherein a phase characteristic of the composite output signal of a first control circuit is maintained at a predetermined level relative to a phase characteristic of the composite output signal of a second control circuit' as being equivalent to 'Coupling among processing units provides phase synchronization among units, which coupling is influenced by inhibitory feedback. Variable clustering of units results' or 'As with IO neurons, where electrotonic coupling leads to phase synchronization, resistive coupling among the processing units of a UCS yields similar behavior. Also, as with IO neurons, inhibitory feedback is provided in which spike generation by a processing unit triggers a decoupling interval during which the unit is decoupled from neighboring processing units. The decoupling interval is approximately as long as a single oscillation period.' There is no statement of synchronization within the claims.

10. In reference to the Applicant's argument:

III. Claim Rejections - 35 U.S.C. § 103

Claims 12-46 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over the published article "Modeling inferior olive neuron dynamics" by Velarde et al. ("Velarde"), in view of the published article "Cerebellar Learning for Control of a Two-Link Arm in Muscle Space" by Fagg et al. ("Fagg"). Applicants respectfully traverse these rejections.

A rejection based on a publication may be overcome by showing that it was published either by the Applicants themselves or on their behalf, unless it is a statutory bar (See MPEP 2132.01, MPEP 715.01(c)). "The rejection can ... be overcome by submission of a specific declaration by the applicant establishing that the article is describing applicant's own work" (MPEP 2132.01, citing In re Katz, 687, F.2d 450, 215 USPQ 14 (CCPA 1982)).

Applicants respectfully submit that Velarde describes Applicants' own work. Attached as Exhibit A is the Rule 132 Declaration of Rodolfo R. Llinas, Vladislav V. Papko, Viktor B. Kazantsev, Vladimir I. Nekorkin, and Vladimir Makarenko, which states that the Velarde reference relied upon by the Examiner in making the obviousness rejections describes Applicants' own work and that the Applicants are the only inventors of the portions of the article relied upon by the Examiner in making the rejections. The Declaration establishes that the other co-author of the Velarde reference (i.e., Manuel G. Velarde) is not a co-inventor of the subject matter described and claimed in the present application. The Declaration further establishes that co-author Manuel G. Velarde contributed to the Velarde reference by providing administrative coordination of research efforts between the other co-authors and by providing non-substantive support which resulted in accelerated preparation of the manuscript and prompt publishing. These contributions were administrative in nature and did not amount to an inventive contribution to the conception of the claimed invention.

Moreover, Applicants submit that Velarde does not qualify as a statutory bar. Velarde was published in the January, 2002 edition of Neural Networks and was made available online November 7, 2001. The present application claims priority to U.S. Provisional Application Serial No. 60/405,191, filed August 21, 2002. Therefore, Velarde was published less than one year prior to the effective filing date of the present application, and thus, does not qualify as a statutory bar.

Further, Fagg does not disclose, teach, or suggest all of the required elements of claims 12- 46. Fagg does not disclose an oscillation output signal, a first spike signal, and a second spike signal that collectively form a composite output signal which is capable of controlling an actuating element as required by each of the independent claims. Additionally, Fagg does not disclose characteristic information of an actuating element being provided as part of an input signal to a control circuit to thereby adjust one of the

amplitude, phase and frequency of the oscillation output signal. At least for the aforementioned reasons, Fagg does not anticipate the independent claims of the present application.

In light of the foregoing, Applicants respectfully submit that Velarde is not prior art to the present application and that Fagg does not teach or suggest all of the required elements of claims 12-46. Accordingly, Applicants respectfully request that the rejections under 35 U.S.C. § 103(a) be withdrawn. Applicants further submit that claims 12-46 are in condition for allowance.

Examiner's response:

The Examiner notes the affidavit submitted on 11/14/2008 and used new art for the rejection.

Examination Considerations

11. The claims and only the claims form the metes and bounds of the invention. "Office personnel are to give the claims their broadest reasonable interpretation in light of the supporting disclosure. *In re Morris*, 127 F.3d 1048, 1054-55, 44USPQ2d 1023, 1027-28 (Fed. Cir. 1997). Limitations appearing in the specification but not recited in the claim are not read into the claim. *In re Prater*, 415 F.2d, 1393, 1404-05, 162 USPQ 541, 550-551 (CCPA 1969)" (MPEP p 2100-8, c 2, l 45-48; p 2100-9, c 1, l 1-4). The Examiner has the full latitude to interpret each claim in the broadest reasonable sense. Examiner will reference prior art using terminology familiar to one of ordinary skill in the art. Such an approach is broad in concept and can be either explicit or implicit in meaning.

12. Examiner's Notes are provided to assist the applicant to better understand the nature of the prior art, application of such prior art and, as appropriate, to further indicate other prior art that maybe applied in other office actions. Such comments are entirely consistent with the intent and sprit of compact prosecution. However, and unless otherwise stated, the Examiner's Notes are not prior art but link to prior art that one of ordinary skill in the art would find inherently appropriate.

13. Examiner's Opinion: Paragraphs 11 and 12 apply. The Examiner has full latitude to interpret each claim in the broadest reasonable sense.

Conclusion

14. The prior art of record and not relied upon is considered pertinent to the applicant's disclosure.

-U. S. Patent 6169981: Werbos

-U. S. Patent Publication 20020077534: DuRousseau

-'Elements of artificial neural networks': Mehrotra

- 'Robotic Fish and Its Application': Terada, Y.

-' Realization of physiological eye movements by automatic selection of control laws using artificial neural network': Wakamatsu, H

15. Claims 12-46 are rejected.

Correspondence Information

16. Any inquiry concerning this information or related to the subject disclosure should be directed to the Examiner Peter Coughlan, whose telephone number is (571) 272-5990. The Examiner can be reached on Monday through Friday from 7:15 a.m. to 3:45 p.m.

If attempts to reach the Examiner by telephone are unsuccessful, the Examiner's supervisor David Vincent can be reached at (571) 272-3080. Any response to this office action should be mailed to:

Commissioner of Patents and Trademarks,

Washington, D. C. 20231;

Hand delivered to:

Receptionist,

Customer Service Window,

Randolph Building,

401 Dulany Street,

Alexandria, Virginia 22313,

(located on the first floor of the south side of the Randolph Building);

or faxed to:

(571) 272-3150 (for formal communications intended for entry.)

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/P. C./

Examiner, Art Unit 2129

Peter Coughlan

12/29/08

/David R Vincent/

Supervisory Patent Examiner, Art Unit 2129